Space Weather Forecast

Issued on Tuesday, 08 August 2023 at 13:06 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Peak risk of Minor/Moderate geomagnetic storm in near-term, greatly lessening through week. Chances of further Minor solar radiation storms gradually falling. Risk of Minor/Moderate radio blackouts reducing after midweek.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose to high in the past 24 hours, peaking with a Strong-class flare from the largest and most active sunspot group of recent days lying over the northwestern solar horizon at 07/2046UTC. Three Moderate-class X-ray flares were also observed, with all of these emanating from a smaller and magnetically less complex region narrowly lagging its neighbour in the northwest on the front side. These were respectively recorded at 07/1937UTC; 07/1608-1632UTC, and 08/0931UTC.

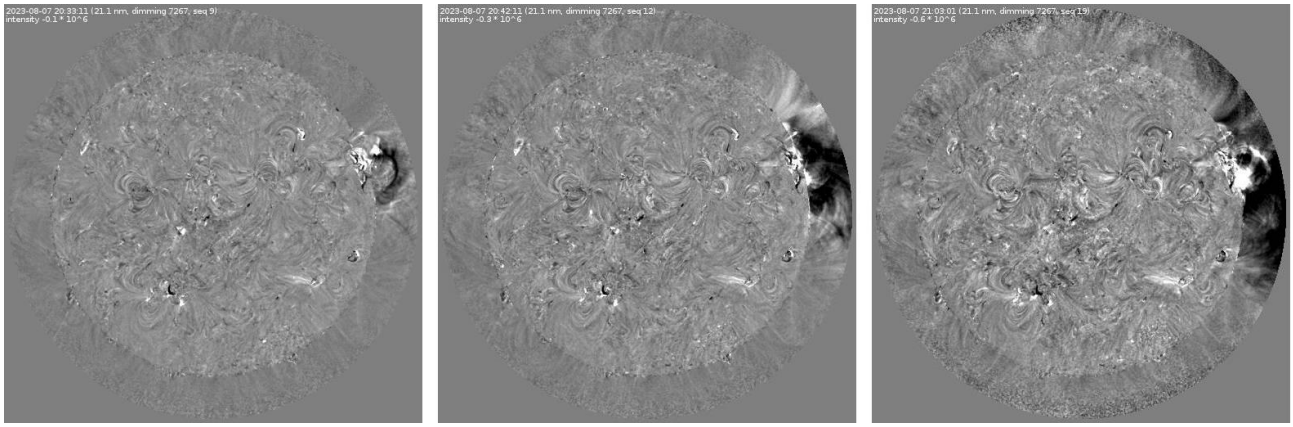

Figure 1: SIDC ROB-processed time integrated extreme UV 'dimming' (often a CME signature), showing the Strong-class flare (white flash) and dimming on the northwestern solar horizon. The resulting CME has been modelled and determined to be a miss.

There remain up to ten sunspot regions on the facing side of the Sun, with two small regions developing, and with the majority now either small, stable and magnetically unipolar, else bipolar and in decay. The main changes in the past 24 hours were seen in the sunspot surviving in the northwest, which showed some reconfiguration of its constituent intermediate spots, with contained detail not visible due to the viewing angle. There appears to be at least some magnetic connection over the horizon to its larger forebear responsible for the Strong flare. Other changes were mainly seen in a less complex spot group in the northeast, which showed minor pores and spots develop, albeit with no significant arising flare activity.

A small, possibly filament-related (arc of plasma) event was observed from the southeast around 07/0230UTC. A faint CME is now visible in satellite imagery heading south of the Sun-Earth line

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near the solar meridian. This is pending analysis, however comparisons between satellites' viewpoints imply a far-sided source. One of the period's Moderate-class flares generated a CME off the Sun-Earth line, while the fast Coronal Mass Ejection (CME) from the Strong flare has been assessed as most likely passing ahead of Earth. No new Earth-directed CMEs were therefore in evidence in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind was initially reflective of a CME-affected regime, with a tentative arrival having occurred narrowly before the start of the reporting window at 07/1105UTC, possibly from a CME that departed the Sun on 05 August.

The solar wind speed showed marked differences between the observing satellites and is perhaps best described as peaking near elevated levels mid-period. The number of particles in the solar wind was perhaps highest early in the 24 hours near the possible CME onset, but generally stayed within background. The associated magnetic field showed a steady decline from its slightly elevated start point, with the north-south component varying within this, with no prolonged period spent anti-aligned with Earth's field (to greatest effect). A discontinuity in most measures was seen around 08/0100UTC, which may have been a resumption of the preceding solar wind regime, with changes generally smoother and smaller in scale after this point.

The net effect of the above solar wind measures was for provisionally quiet indices, peaking just below Minor Storm G1 in the 21-24UTC interval.

Energetic Particles / Solar Radiation: Proton flux showed a response to the Strong-class X-ray flare, peaking at 07/2046UTC. This breached S1 Minor Solar Radiation storm levels (starting at 10pfu) at 08/0100UTC, eventually drifting up to a plateau value near 27pfu at 08/0545UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Further Moderate-class X-ray flares are likely for the remainder of the current UTC day (08 August) from either of the (recent) sunspot groups in the northwest. This potential then recedes however, with the surviving northwest active region soon following on the coat-tails of its larger neighbour in departing the facing side on day two (09 August). Activity should then decline to low, with a chance of returning to Moderate each day, with any contribution from the arriving eastern solar horizon uncertain.

Solar Wind / Geomagnetic Activity: No coronal hole fast winds feature, and there are no new modelled Earth-bound CMEs in the past 24 hours.

This potentially leaves a risk of one or two further CME arrivals over the remainder of day 1 (08 August), with attribution uncertain but perhaps stemming from events on 05 August. Any enhancement to round out day one may perhaps persist into day two (08 into 09 August). Beyond this, solar winds should decline towards background.

An initial peak of likely G1/Minor Storm intervals, and a now-reduced chance of G2 Moderate Storms, should fall after midweek to be mainly quiet.

Energetic Particles / Solar Radiation: The proton flux should show a decreasing risk of further breaches of S1, as the primarily responsible region rotates further around the far side, falling from being 'expected' to a near background 'slight chance' by the second half of the current UTC working week. 1pfu 100MeV enhancements and 10MeV enhancements as high as S3 (Major Solar Radiation Storm) appear unlikely throughout.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	70	20	1	1
Strong	G3	No	10	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	50	40	40
Very Active	R3 to R5 X	Yes	10	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	50	10	5
Very Active	≥ S3 *	No	5	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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